CURRICULA FOR BACHELOR OF SCIENCE (BSC) IN INTERACTION DESIGN, 2021

BACHELOR OF SCIENCE (BSC) AALBORG

MODULES INCLUDED IN THE CURRICULUM
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INTERACTION DESIGN (P0)

2021/2022

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

Disclaimer.
This is an English translation of the module. In case of discrepancy between the translation and the Danish version, the Danish version of the module is valid.

PURPOSE
The purpose of the project module is to introduce interaction design and create a foundation for the formation of identity as an interaction designer. Emphasis is placed on working with the interactive conditions (computer science) and design conditions (industrial design) of a concrete interactive product, where the focus is on interaction and design, partly as separate properties of the product, but also with a focus on the interaction between these two properties. In the project module, emphasis is placed on a descriptive and explanatory approach, where the interactive product is described and explained in relation to its interaction design. Each project group must choose a specific interactive product based on the project presentation on the module. Emphasis is also placed on the students being able to motivate and explain their choice of product as an example of an interaction design.

LEARNING OBJECTIVES

KNOWLEDGE

• be able to demonstrate an initial knowledge of interaction design and specific issues related to interaction design
• be able to demonstrate how to obtain relevant data on interaction design from a specific interactive product product

SKILLS

• be able to describe issues within interaction design that relate to interactive and design properties of an interactive product
• be able to identify related literature and use this to analyze the topic from interaction and design perspectives
• be able to conclude and formulate challenges and issues for further work with interaction design

COMPETENCES

• be able to plan and implement a completed and academically sound perspective and treatment of a selected subject area within the P0 theme

TYPE OF INSTRUCTION

Project work

EXTENT AND EXPECTED WORKLOAD

The student is expected to spend 27.5 hours per ECTS, which for this activity means 137.5 hours.

EXAM

EXAMS

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<tr>
<th>Name of exam</th>
<th>Interaction Design (P0)</th>
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<td>Passing the project module requires participation in a presentation seminar.</td>
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Curricula for bachelor of Science (BSc) in Interaction Design, 2021

### ADDITIONAL INFORMATION

Contact: Study Board for Computer Science via cs-sn@cs.aau.dk or 9940 8854

### FACTS ABOUT THE MODULE

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<tr>
<td>Responsible for the module</td>
<td>Lone Leth Thomsen</td>
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### ORGANISATION

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<td>Department of Computer Science</td>
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<tr>
<td>Faculty</td>
<td>Technical Faculty of IT and Design</td>
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</table>
UNDERSTANDING DESIGN (P1)

2021/2022

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

PURPOSE
The purpose of the project module is to introduce students to design understanding through systematic assessment and analysis of an interaction design (IT system), where crucial emphasis is placed on user-centered usability evaluations as the empirical basis for the project module. The focus is primarily on the usefulness of a design, but also its usability and application value. In addition, the project module's goal is to introduce the students to problem-oriented project work, working with project management, conflict management, and collaboration.

LEARNING OBJECTIVES

KNOWLEDGE

• be able to demonstrate an understanding of an interaction design, including the design's usability, user-friendliness and application value.
• must acquire knowledge of problem-oriented project work, including project management, conflict management, and collaboration.

SKILLS

• must be able to plan, carry out and report on a usability evaluation
• must be able to apply principles of usability in analysis of an interaction design
• must be able to outline a solution proposal for a specific identified usability problem
• must be able to convey the project's work results and work processes in a structured and comprehensible way, both in writing, graphically and orally

COMPETENCES

• must have acquired the ability to systematically evaluate and analyze an interaction design
• must be able to organize, implement, and reflect on problem-based project work

TYPE OF INSTRUCTION

Project work

EXTENT AND EXPECTED WORKLOAD

The student is expected to spend 27.5 hours per ECTS, which for this activity means 275 hours.

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Criteria of assessment
The criteria of assessment are stated in the Examination Policies and Procedures

ADDITIONAL INFORMATION
Contact: Study Board for Computer Science via cs-sn@cs.aau.dk or 9940 8854

FACTS ABOUT THE MODULE

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INTERACTION DESIGN 1: USABILITY AND SKETCHING

2021/2022

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

Disclaimer.
This is an English translation of the module. In case of discrepancy between the translation and the Danish version, the Danish version of the module is valid.

PURPOSE
The module aims to provide the student with knowledge about the concept of usability and usability evaluations, and the roles and tasks involved in an evaluation. In addition, the purpose is to give the student the competence to be able to use sketching to communicate an interaction design. The aim of the module is to provide the student with knowledge that supports analysis and assessment of the user-friendliness and usability of IT systems, as well as skills to communicate interaction design visually.

The course also involves the introduction to, and use of, the usability laboratory at the Department of Computer Science.

LEARNING OBJECTIVES

KNOWLEDGE

• must acquire basic knowledge of the concept of usability and its definitions
• must gain knowledge of the key activities in a usability evaluation
• must gain knowledge of roles and tasks in a usability evaluation and knowledge of identifying usability problems
• must acquire knowledge of sketching and techniques for sketching

SKILLS

• be able to accurately explain the concept of usability and explain the activities in a usability evaluation
• must have practiced the ability to plan and perform a usability evaluation of a specific IT system in a usability laboratory
• be able to identify and describe usability problems from a specific evaluation
• be able to sketch using basic shapes, as well as apply perspective and show action in a drawing
• be able to apply basic principles and techniques for the production of sketches, for example, annotation, composition and contrasts

COMPETENCES

• be able to carry out a complete usability evaluation of an IT system
• be able to use sketching to illustrate an interaction design

TYPE OF INSTRUCTION

The teaching is organized in accordance with the general teaching methods for the education, cf. section 17.

EXTENT AND EXPECTED WORKLOAD

The student is expected to spend 27.5 hours per ECTS, which for this activity means 137.5 hours.
**EXAM**

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**ADDITIONAL INFORMATION**

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PROBLEM BASED LEARNING
2021/2022

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

• central approaches, concepts and techniques in problem based learning
• different problem types, project types and their mutual relations
• theory of science in a problem based learning context

SKILLS

• define problem based learning with theory as well as own experiences as starting point
• plan and manage problem based project work taking into consideration the given problem type, team constellation and the duration of the project
• identify, analyse and formulate an open and complex problem considering its human and societal context
• point out relevant focus areas, concepts and methods to open and sustainable problem solving of complex problems
• discuss methodological impacts of different theory of science positions when working problem based
• analyse, compare and evaluate the processes of working with different problem types
• analyse and evaluate the processes of working team based in a problem based project, including project planning, monitoring and team development

COMPETENCES

• develop study practice aligned with a problem based, project organised and digitalised learning environment
• point out, try out and evaluate relevant techniques and approaches to improve a problem based project work
• transfer own experiences from a problem based project to guidelines for comparable projects
• evaluate own progression in problem based learning, based on experience and learning theory

TYPE OF INSTRUCTION

See § 17: Structure and content of the programme

EXAM

EXAMS

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<td>Jette Egelund Holgaard</td>
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ORGANISATION

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<td>Technical Faculty of IT and Design</td>
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INTRODUCTION TO PROGRAMMING

2021/2022

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

Disclaimer
This is an English translation of the module. In case of discrepancy between the translation and the Danish version, the Danish version of the module is valid.

Purpose
Students who complete this module achieve a basic skill in programming.

The student gets a basic introduction to the concepts behind client-server based networks and underlying protocols. In addition, the student gets introduction to client- and server-side development. This gives the student an understanding of basic concepts and mechanisms in a programming language, so that these can be used to implement smaller applications.

LEARNING OBJECTIVES

KNOWLEDGE

• understand the build-up of client-server networks
• understand methods of program design and ability to distinguish between good and bad programming practices
• understand the basic principles of a programming language, including understanding control structures, data types, data structures, and functions;

SKILLS

• apply acquired knowledge in the design of a simple application
• implementing, interpreting, and analyzing code
• use programming skills to process and process input from keyboard and mouse
• use programming skills to design and implement basic functions
• discuss and assess the quality of a given code

COMPETENCES

• evaluate existing code, evaluate its design, and propose changes
• use specified web programming languages to solve specific programming tasks

TYPE OF INSTRUCTION

The teaching is organized in accordance with the general teaching methods for the education, cf. section 17

EXTENT AND EXPECTED WORKLOAD

The student is expected to spend 27.5 hours per ECTS, which for this activity means 137.5 hours.

EXAM

EXAMS

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<tr>
<th>Name of exam</th>
<th>Introduction to Programming</th>
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### ADDITIONAL INFORMATION

Contact: Study Board for Computer Science via cs-sn@cs.aau.dk or 9940 8854

### FACTS ABOUT THE MODULE

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<td>Lone Leth Thomsen</td>
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<td>Faculty</td>
<td>Technical Faculty of IT and Design</td>
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DESIGN ALTERNATIVES

2021/2022

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE
The module builds on knowledge gained in the 1st semester

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

Disclaimer
This is an English translation of the module. In case of discrepancy between the translation and the Danish version, the Danish version of the module is valid.

PURPOSE
The purpose of the project module is to introduce the students to designing alternatives, where students work with one case that defines requirements for a future interaction design, and where the work consists of identifying and designing alternatives to that case. The focus is on both the process and the product in connection with the preparation of these design alternatives, and work is done with both constructive and experimental approaches in the process, including different approaches to prototyping. In the project, special emphasis is placed on working with a creative and innovative approach to alternatives, so that the student meets some of the challenges in generating and developing design alternatives that covers a larger design space. The project module case specifies a number of design requirements within a given area, e.g. e-commerce or social media, and builds to use of a particular technology, e.g. web.

LEARNING OBJECTIVES

KNOWLEDGE

• must be able to demonstrate knowledge of preparing interaction design proposals for a specific case, including visual design, design of user interaction, and systematic work with design alternatives.

SKILLS

• must be able to prepare interaction design proposals based on design principles and guidelines for visual design, as well as be able to integrate these principles and guidelines with different forms of interaction
• must be able to use prototyping as a tool in connection with the preparation and evaluation of design proposals
• must be able to work systematically with the assessment of different design alternatives in relation to each other
• must be able to justify design choices in principles and guidelines for interaction design as well as argue for strengths and weaknesses in the designed design proposals

COMPETENCES

• must be able to prepare a number of interaction design alternatives for a specific case which creates a number of design possibilities, and be able to reflect on the strengths and weaknesses of the individual alternatives
• must be able to organize, implement, and reflect on problem-based project work

TYPE OF INSTRUCTION

Project work

EXTENT AND EXPECTED WORKLOAD

The student is expected to spend 27.5 hours per ECTS, which for this activity means 412.5 hours.
## EXAM
### EXAMS

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## ADDITIONAL INFORMATION

Contact: Study Board for Computer Science via cs-sn@cs.aau.dk or 9940 8854

## FACTS ABOUT THE MODULE

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INTERACTION DESIGN 2: VISUAL DESIGN AND PROTOTYPING

2021/2022

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

The module builds on knowledge gained in the 1st semester

CONTENT, PROGRESS AND PEDAGOGYOFTHEMODULE

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This is an English translation of the module. In case of discrepancy between the translation and the Danish version, the Danish version of the module is valid.

PURPOSE

The module aims to provide the student with knowledge of design principles and guidelines for visual design, knowledge of gestalt laws, and knowledge of human cognition, such as human memory and perception, and the importance of cognition for the use of IT systems, as well as providing knowledge of various forms of interaction. In addition, prototyping is introduced as a technique in an interaction process, where the student becomes able to design a user interface, where visual design principles, guidelines and gestalt laws are used in interaction with forms of interaction.

LEARNING OBJECTIVES

KNOWLEDGE

• acquire knowledge of design principles and guidelines for visual design
• be familiar with gestalt laws and their relation to user interfaces must acquire basic knowledge of human cognition, including attention, perception, and memory
• acquire knowledge of different forms of interaction and know their strengths and weaknesses in user interaction
• gain knowledge of principles of web design, such as visual design principles of web design, architectures of web design, or Web 2.0
• gain knowledge of different types of prototypes - for example Hi-Fi or Lo-Fi prototypes
• know the roles of prototypes in an interaction design process

SKILLS

• be able to explain the central design principles and guidelines for visual design accurately
• be able to explain human cognition and its significance for the use of IT systems
• be able to apply different design principles and guidelines for visual design at a basic level
• be able to explain different forms of interaction precisely
• be able to carry out a prototyping process with focus on design of user interface

COMPETENCES

be able to apply visual design principles and gestalt laws in an interaction design process based on prototyping

TYPEOFINSTRUCTION

The teaching is organized in accordance with the general teaching methods for the education, cf. section 17.

EXTENT AND EXPECTED WORKLOAD

The student is expected to spend 27.5 hours per ECTS, which for this activity means 137.5 hours.
EXAM

EXAMS

<table>
<thead>
<tr>
<th>Name of exam</th>
<th>Interaction design 2: Visual Design and Prototyping</th>
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<td>The criteria of assessment are stated in the Examination Policies and Procedures</td>
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ADDITIONAL INFORMATION

Contact: Study Board for Computer Science via cs-sn@cs.aau.dk or 9940 8854

FACTS ABOUT THE MODULE

<table>
<thead>
<tr>
<th>Danish title</th>
<th>Interaktionsdesign 2: visuelt design og prototyping</th>
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ORGANISATION

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MODELLERINGSTEKNIK OG RENDERINGSMETODER I 3D
2021/2022

MODULETS INDHOLD, FORLØB OG PÆDAGOGIK

Modulet har til formål at udvide de studerendes kompetencer indenfor analoge og digitale fremstillingsteknikker til konstruktion og visualisering af objekter og strukturer i 3D. Kurset introducerer således de studerende til opbygning af objekter og strukturer ved hjælp af CAD-værktøjer, og der tages udgangspunkt i bearbejdning af et design fra skitseform til præsentationen af en visualisering af designet gennem anvendelse af modelleringsstrategier. Modulet introducerer desuden de studerende til visualisering af objekters formkarakteristika igennem analoge og digitale renderingsteknikker som en del af den integrerede proces, eksempelvis ved brug af marker mixed media og gængse renderingsværktøjer.

LÆRINGSMÅL

VIDEN

• Skal have viden om 3D-modellering integreret i designprocessen
• Skal have kendskab til fagspecifikke standarder indenfor 3D CAD-værktøjer
• Skal have viden om metode, teknikker og begreber indenfor 3D-modellering
• Skal have kendskab til digitale 3D-renderings- og visualiseringsteknikker
• Skal have kendskab til analoge renderings- og visualiseringsteknikker

FÆRDIGHEDER

• Skal kunne anvende gængs CAD-værktøj til konstruktion i 3D
• Skal kunne vurdere teoretiske og praktiske problemstillinger i forhold til forskellige modelleringsstrategier samt begrunde valgte løsninger
• Skal kunne visualisere og kommunikere objekters materialemæssige og formmæssige karakteristika med analoge og digitale renderingsteknikker
• Skal kunne anvende modellerings- og renderingsteknikker til at styrke en iterativ arbejdsproces mellem digitale og analoge teknikker
• Skal kunne inddrage basale overvejelser vedr. tværsnitsudformning med henblik på delobjekters styrke og stivhed

KOMPETENCER

• Skal kunne vælge relevante 3D-arbejdsmetoder til en given opgave
• Skal selvstændigt kunne udvælge og udføre relevante digitale og analoge renderingsteknikker til en given opgave som en integreret del af en arbejdsproces der understøtter udviklingen af et design
• Skal kunne identificere særlige detaljer af et givent produkt eller struktur og fokuseret kommunicere disse igennem analog og digital lyssætning og rendering
• Skal kunne formgive med hensyntagen til lastindføringer og strukturel stivhed

UNDERVISNINGSFORM

Se generel beskrivelse af anvendte undervisningsformer i § 17.

EKSAMEN

PRÆVER

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Bedømmelsesform | Bestået/ikke bestået
Censur | Intern prøve
Vurderingskriterier | Vurderingskriterierne er angivet i Universitetets eksamensordning

**FAKTA OM MODULET**

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<td>Modulansvarlig</td>
<td>Sarah Guldhammer, Claus Lassen</td>
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**ORGANISATION**

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<td>Det Tekniske Fakultet for IT og Design</td>
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DATALOGIENS MATEMATISKE GRUNDLAG

2021/2022

MODULETS INDHOLD, FORLØB OG PÆDAGOGIK

LÆRINGSMÅL

VIDEN

• logik: sammensatte udsagn, ækvivalens, prædikater og kvantorer
• mængdelære: operationer på mængder, identiteter, potensmængder
• funktioner. herunder ekponentiel og logaritmefunktionen med grundtal 2 samt deres vækstforhold
• algoritmer: pseudokode, søge og sorteringsalgoritmer, kontrolstrukturer, løkker, iterative og rekursive algoritmer
• datastrukturer: Herunder arrays og hægtede lister
• induktionsbeviser
• relationer: refleksiv, transitiv, symmetrisk, ækvivalensrelationer

FÆRDIGHEDER

• kunne ræsonnere i forbindelse med problemstillinger i logik, mængdelære og teori om relationer
• kunne udføre simple induktionsbeviser

KOMPETENCER

• kunne læse pseudoalgoritmer og implementere disse i et passende programmeringssprog (eksempelvis Maple)
• kunne designe algoritmer til løsning af simple problemstillinger

UNDervISNINGSFORM

Undervisningen tilrettelægges i henhold til de generelle undervisningsformer for uddannelsen, jf. § 17.

OMFANG OG FORVENTET ARBEJDSINDSATS

Kursusmodulets omfang er 5 ECTS svarende til 137,5 timers studieindsats.

EKSAMEN

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YDERLIGERE INFORMATIONER
# Fakta om Modulet

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## Organisering

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<td>Det Ingeniør- og Naturvidenskabelige Fakultet</td>
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DESIGNING WITH USERS

2021/2022

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE
The module builds on knowledge gained in the 1st and 2nd semester

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

Disclaimer
This is an English translation of the module. In case of discrepancy between the translation and the Danish version, the Danish version of the module is valid.

PURPOSE
The purpose of the project module is to introduce the students in collaboration with users in an interaction design process, where the focus is on involving future users early in the process based on needs and context, and crucial emphasis is placed on empirical assessments of products designed, and focus on an iterative design process. In addition, the goal is for the process to be translated into an interactive prototype. In the project, emphasis is placed on working with both qualitative and quantitative methods in the collaboration with users, and the developed interactive product must be able to be anchored in the empirical work with users. The project subject could be diverse, but it should be strived for that the users and the context of use are available for the project. As part of the project module, a documentary video must be prepared that depicts the project’s problem, design process and solution.

LEARNING OBJECTIVES

KNOWLEDGE
- must be able to demonstrate knowledge of collaboration with users in all key phases of an interaction design process (cf. the User-Centered Design tradition), including early focus on users, needs, and context, empirical assessments and iterative design

SKILLS
- must be able to plan and implement a User-Centered Design process, including establishing a collaboration with specific users on a specific issue, and preparation of an interactive prototype through iterative design and assessment
- must be able to justify the design of the prepared interaction design in specific empirical needs and context

COMPETENCES
- must be able to develop an interaction design that is firmly rooted in users’ needs and situation, and be able to reflect on a user-centered design process

TYPE OF INSTRUCTION
Project work

EXTENT AND EXPECTED WORKLOAD
The student is expected to spend 27.5 hours per ECTS, which for this activity means 412.5 hours.
### EXAMS

<table>
<thead>
<tr>
<th>Name of exam</th>
<th>Designing with Users</th>
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### ADDITIONAL INFORMATION

Contact: Study Board for Computer Science via cs-sn@cs.aau.dk or 9940 8854

### FACTS ABOUT THE MODULE

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<thead>
<tr>
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<th>Design med brugere</th>
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### ORGANISATION

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INTERACTION DESIGN 3: USER-CENTERED DESIGN

2021/2022

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

The module builds on knowledge gained in the 1st and 2nd semester

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

Disclaimer
This is an English translation of the module. In case of discrepancy between the translation and the Danish version, the Danish version of the module is valid.

PURPOSE
This course module aims to provide the student with the knowledge, methods and skills to study users and interact with them through a design process. User study methods are introduced and trained, which focus on what the users do, use, state, create and think, as well as the physical and ergonomic factors in relation to use and user. Thereby, the student must acquire competence in designing for the user's recognized and unrecognized needs with respect for the user and his context and culture.

LEARNING OBJECTIVES

KNOWLEDGE

must have knowledge of the potentials, limitations and directions of the user-oriented design approach, covering from the acting perspective to physical factors

SKILLS

• must be able to account for various user-oriented methods, including their field of action and benefits
• must be able to perform and use observation to collect data on user behavior
• must be able to perform and use interviews and other suitable methods and tools for collecting user data
• must be able to structure collected user data and use this as design material

COMPETENCES

• must be able to plan and carry out user-oriented design activities, as well as include information on use as a basis for the design solution
• must be able to plan and organize a design process that extensively involves users and focuses on their needs

TYPE OF INSTRUCTION

The teaching is organized in accordance with the general teaching methods for the education, cf. section 17.

EXTENT AND EXPECTED WORKLOAD

The student is expected to spend 27.5 hours per ECTS, which for this activity means 137.5 hours.

EXAM

EXAMS

| Name of exam | Interaction Design 3: User-centered Design |
**Type of exam**  
Written or oral exam

**ECTS**  
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**Assessment**  
7-point grading scale

**Type of grading**  
Internal examination

**Criteria of assessment**  
The criteria of assessment are stated in the Examination Policies and Procedures

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**ADDITIONAL INFORMATION**

Contact: Study Board for Computer Science via cs-sn@cs.aau.dk or 9940 8854

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**FACTS ABOUT THE MODULE**

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<th>Interaktionsdesign 3: brugercentreret design</th>
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INTEGRATED PRODUCT DEVELOPMENT: REDESIGN
2021/2022

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE
The module builds on knowledge gained at 1st and 2nd semester at the bachelor's program in Interaction Design

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

Disclaimer
This is an English translation of the module. In case of discrepancy between the translation and the Danish version, the Danish version of the module is valid.

PURPOSE
The purpose of the module is to develop the students' ability to systematically handle relatively simple redesign processes for products using basic tools and methods within structured idea generation, physical ergonomics understanding and form analysis and development. The student can work with redesign of a given product with predefined references within form, styling and aesthetics, which must be integrated with functionality and construction. Digital tools for rendering, possibly with image manipulation, together with image composition form the basis for accurate visual presentation of the redesign.

LEARNING OBJECTIVES

KNOWLEDGE

• must have knowledge of theories and methods for redesign processes of products based on the use and user perspective
• must be able to account for basic methods for systematic idea generation and product development within the engineering and designer area
• must be able to account for and analyze theory and methods for basic physiological ergonomic conditions related to product development; including the basics of anthropometry, elementary functional anatomy of the musculoskeletal and neurophysiological systems, as well as known general injury mechanisms in relation to the use of products and ergonomic characterizations of comfort and discomfort.
• must have knowledge of basic methods for systematic analysis, description of form and expression related to product design

SKILLS

• must be able to carry out basic systematic analysis and development of function and expression-related aspects from a use perspective
• must be able to seek out and use anthropometric information, as well as ergonomic methods and metrics for analysis and evaluation of product use and application related to human physiology, including specifically being able to identify potentially critical work / interaction situations in relation to the product, in order to design a implicitly appropriate use
• must be able to visualize and communicate functional and expressive aspects using the subject's relevant digital tools
• must be able to design simple products based on predefined visual reference points and integrate this with the product's features

COMPETENCES

• must be able to methodically support the redesign of simple products through a systematic methodical product development process that primarily integrates form and function from predefined reference points and actively relates to the user's perspective, including especially physiology and ergonomics
must be able to identify, visualize and communicate the most important functional and expressive properties and strengths of a product proposal with professional tools

TYPE OF INSTRUCTION

The teaching is organized in accordance with the general teaching methods for the education, cf. section 17.

EXTENT AND EXPECTED WORKLOAD

The student is expected to spend 27.5 hours per ECTS, which for this activity means 137.5 hours.

EXAM

EXAMS

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ADDITIONAL INFORMATION

Contact: Study Board for Computer Science via cs-sn@cs.aau.dk or 9940 8854

FACTS ABOUT THE MODULE

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ORGANISATION

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</table>
IMPERATIVE PROGRAMMING

2021/2022

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

Disclaimer.
This is an English translation of the module. In case of discrepancy between the translation and the Danish version, the Danish version of the module is valid.

PURPOSE
In this course, the student will gain insight into basic concepts such as algorithms, data structures and computer architectures

REASONS
Computers, regardless of subject area, are one of the most important problem-solving tools today. Therefore, the student must acquire a knowledge of basic computer science concepts so they will be able to solve problems using imperative programming languages.

LEARNING OBJECTIVES

KNOWLEDGE

• Development environment and compilation
• Imperative principles
• Data types and variables
• Control structures
• Functions and procedures
• Data structures including arrays
• Input / Output
• Composite data structures
• Simple algorithms (eg sorting and searching)
• Basic testing of programs

SKILLS

• write, run and test programs incorporating the above-mentioned basic concepts into the solution
• apply correct subject terminology

COMPETENCES

both independently and in collaboration with others, implement an imperative program as a solution to a defined task

TYPE OF INSTRUCTION

Teaching is organized in accordance with the general teaching methods of the education, cf. section 17

EXTENT AND EXPECTED WORKLOAD

The student is expected to spend 27.5 hours per ECTS, which for this activity means 137.5 hours
EXAM

EXAMS

<table>
<thead>
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ADDITIONAL INFORMATION

Contact: Study Board for Computer Science via cs-sn@cs.aau.dk or 9940 8854

FACTS ABOUT THE MODULE

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<td>Lone Leth Thomsen</td>
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<td>Faculty</td>
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DESIGN AND CONSTRUCTION

2021/2022

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE
The module builds on knowledge gained in 1.-3. semester

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

Disclaimer
This is an English translation of the module. In case of discrepancy between the translation and the Danish version, the Danish version of the module is valid.

PURPOSE
The purpose of the project module is to introduce the student to moving from design requirements in a given case to a functional interactive system, where the focus is on using opportunities in a specific programming environment. The goal is to develop a fully functional interactive prototype, which must be tested in relation to the requirements in a design proposal. The project module is based on one or more specific cases.

LEARNING OBJECTIVES

KNOWLEDGE
• must be able to demonstrate knowledge of the design and construction of an interactive system, including the use of possibilities in a specific programming environment for the realization of a number of set design requirements

SKILLS
• must be able to implement an interactive system including using and understanding concepts, structures and facilities in a programming environment to construct a well-structured system
• must be able to carry out systematic testing of the system's functionality in relation to the set design requirements
• must be able to justify the design and construction of the interactive system in relation to the set design requirements

COMPETENCES
• must be able to translate design requirements into a functional interactive system, and be able to reflect on possibilities and limitations in programming environments

TYPE OF INSTRUCTION
Project work

EXTENT AND EXPECTED WORKLOAD
The student is expected to spend 27.5 hours per ECTS, which for this activity means 412.5 hours.

EXAM

EXAMS

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**ADDITIONAL INFORMATION**

Contact: Study Board for Computer Science via cs-sn@cs.aau.dk or 9940 8854

**FACTS ABOUT THE MODULE**

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**ORGANISATION**

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<td>Faculty</td>
<td>Technical Faculty of IT and Design</td>
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INTERACTION DESIGN 4: QUANTITATIVE METHODS

2021/2022

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE
The module builds on knowledge gained in 1. -3. semester

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

Disclaimer
This is an English translation of the module. In case of discrepancy between the translation and the Danish version, the Danish version of the module is valid.

PURPOSE
Quantitative methods for collecting and processing quantitative data, including experimental design and statistical analysis, their scientific theoretical assumptions and their practical applications in interaction design. The module provides an in-depth introduction to methods for collecting quantitative data including questionnaires and experiments. Including basic concepts such as e.g. questionnaire design, experiment design, hypotheses, dependent and independent variables, within- and between-subject design, randomization, sampling and scale construction, as well as statistical tests and analyzes, such as descriptive statistics, T-tests, variance tests, and non-parametric tests. The course also introduces the specific applications of quantitative methods in interaction design, and trains the students' ability to select and apply quantitative methods.

LEARNING OBJECTIVES

KNOWLEDGE

- must be able to account for quantitative methods and statistical analyzes, their core concepts, applications, strengths, weaknesses, and limitations
- must be able to demonstrate insight into differences and similarities between different quantitative methods in relation to their specific application possibilities
- must be able to demonstrate knowledge of the application of quantitative methods to highlight issues related to interaction design

SKILLS

- must be able to use quantitative methods to highlight key issues concerning interaction design empirically and analytically
- must be able to formulate, assess and convey key issues within the concepts, application and limitations of the quantitative method
- must be able to argue on a methodological and methodological scientific basis

COMPETENCES

- must be able to carry out a specific quantitative study in relation to an issue concerning interaction design, and be able to argue for the chosen method, as well as reflect on its strengths and weaknesses

TYPE OF INSTRUCTION

The teaching is organized in accordance with the general teaching methods for the education, cf. section 17.

EXTENT AND EXPECTED WORKLOAD

The student is expected to spend 27.5 hours per ECTS, which for this activity means 137.5 hours.
### EXAM

**EXAMS**

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### ADDITIONAL INFORMATION

Contact: Study Board for Computer Science via cs-sn@cs.aau.dk or 9940 8854

### FACTS ABOUT THE MODULE

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<tr>
<td>Responsible for the module</td>
<td>Lone Leth Thomsen</td>
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### ORGANISATION

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<td>Department of Computer Science</td>
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<tr>
<td>Faculty</td>
<td>Technical Faculty of IT and Design</td>
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</table>
REAL-TIME INTERFACES AND INTERACTIONS

2021/2022

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

Objectives:
Real-time Interfaces and Interactions is a course module offering the students opportunities to investigate technologies addressing different modalities that are commonly associated with creation of integrated multimodal interactive systems. The course is built upon the previous five semesters to augment foundational knowledge, skills and competences needed to achieve integration of technologies and evaluation methods.

LEARNING OBJECTIVES

KNOWLEDGE

Students who complete the module will obtain the following qualifications:

• Understanding of the state-of-the-art in the field of alternative input and output technologies for uni- and multimodal applications (application)
• Understanding of visualization techniques such as virtual or augmented reality (application)
• Understanding of sound design methods and real-time audio processing techniques such as interactive auralization and sonification (application)
• Understanding of the measurement and analysis of physiological data via sensors detecting signals present in the human body for techniques such as affective computing
• Understanding of haptic interfaces, theory and implementation of haptic feedback systems using vibrotactile stimulation
• Understanding adaptive systems which change behaviour according to user input within a session
• Understanding of iterative design processes as used in the design of real-time interfaces and multimodal interactive systems

SKILLS

Students who complete the module will obtain the following qualifications:

• Ability to synthesise new interface components of responsive Human-Computer Interaction systems, and log data from users and/or their interactions for data analysis
• Ability to scientifically analyse and argue with theoretical and methodological justification to demonstrate understanding of related research/work in the current scientific discourse
• Ability to apply real-time sensor inputs in the design of an interactive media product
• Ability to synthesise and apply contextual understanding and knowledge related to human factors in the design of novel interfaces
• Ability to apply theories, techniques and methods for the design and implementation of systems which can adapt to human needs and level of expertise

COMPETENCES

Students who complete the module will obtain the following qualifications:

• Ability to synthesise knowledge and understanding regarding previous research and current trends concerning interactive media systems
• Ability to apply such knowledge, understanding and skills toward creation of new interfaces and interactive systems that function in real-time (low latency response)

TYPE OF INSTRUCTION

Refer to the overview of instruction types listed in § 17.
EXAM

PREREQUISITE FOR ENROLLMENT FOR THE EXAM

- To be eligible to take the exam the student must have fulfilled:
  - handing in of written assignments or the like
  - completion of certain – or all – study activities

EXAMS

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<thead>
<tr>
<th>Name of exam</th>
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<tbody>
<tr>
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<td>Written or oral exam</td>
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<td>Permitted aids</td>
<td>With certain aids:</td>
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FACTS ABOUT THE MODULE

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<tr>
<td>Responsible for the module</td>
<td>Claus Brendgaard Madsen</td>
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ORGANISATION

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<tr>
<td>Faculty</td>
<td>Technical Faculty of IT and Design</td>
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OBJECT-ORIENTED PROGRAMMING

2021/2022

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE
The module builds on knowledge gained in the course Imperative programming.

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

Disclaimer
This is an English translation of the module. In case of discrepancy between the translation and the Danish version, the Danish version of the module is valid.

PURPOSE
That the student learns the essential concepts and structuring mechanisms within object-oriented programming languages and acquires skills in programming in a language within this paradigm.

REASON
Object-oriented programming is a dominant programming paradigm in software development.

LEARNING OBJECTIVES

KNOWLEDGE
The student must gain an understanding of theories and methods within the object-oriented programming paradigm, and here especially the following aspects:

• concepts and concept formation within object orientation
• classes and objects
• data access, properties and methods
• first-class methods
• collection classes
• specialization, expansion and inheritance
• polymorphism and dynamic bonding
• inheritance
• interfaces and abstract classes
• exception handling
• generic types and methods
• contracts and assertions

SKILLS

• be able to program in an object-oriented programming language so that the key features of those languages are used
• be able to explain and argue for contexts and details in an object-oriented program
• be able to prepare and carry out a systematic testing of an object-oriented program

COMPETENCES

• be able to design and document an object-oriented program so that it can run and is understandable, readable, and accessible to other programmers
TYPE OF INSTRUCTION

A mix of lectures, smaller exercises and a larger assignment.

EXTENT AND EXPECTED WORKLOAD

The student is expected to spend 27.5 hours per ECTS, which for this activity means 137.5 hours.

EXAM

EXAMS

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<td>Oral test based on a larger assignment. In the larger assignment, the students (individually or in small groups) must develop an object-oriented program, which should solve a pre-formulated and delimited problem. The course provider determines the maximum group size and defines a specific area within which the problem for the larger task must be found. The students have a certain freedom to influence the problem formulation. The program and its documentation must be submitted in print and in electronic form.</td>
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<td>Assessment</td>
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ADDITIONAL INFORMATION

Contact: Study Board for Computer Science via cs-sn@cs.aau.dk or 9940 8854

FACTS ABOUT THE MODULE

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## ORGANISATION

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<td>Faculty</td>
<td>Technical Faculty of IT and Design</td>
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INTERACTIVE PHYSICAL DESIGN

2021/2022

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE
The module builds on knowledge gained in 1.-4. semester

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

Disclaimer.
This is an English translation of the module. In case of discrepancy between the translation and the Danish version, the Danish version of the module is valid.

PURPOSE
The purpose of the project module is to introduce students to the development of interactive physical products that can make everyday life easier in various ways, such as robots and products with built-in intelligence including movement, simple electronic control, interface and mechanical solutions are integrated as part of its functionality and aesthetics. In the project, emphasis is placed on working with an original, innovative solution at a balanced technical-aesthetic level, where experiences from the course modules are integrated into concept development or detailing of the project. The topic of the project could be designing kitchen utilities, dispensers, garden tools, personal aids or toys. The product proposal is developed with extensive use of different types of models such as function models, vision models and detailed models. Particular emphasis is placed on the interplay between an investigative, testing and reflective methodology and an iterative process.

LEARNING OBJECTIVES

KNOWLEDGE

• must be able to demonstrate knowledge of limitations and possibilities in the design and construction of an interactive physical product, including technical as well as design and interaction aspects

SKILLS

• must be able to specify opportunities, limitations and visions for interactive physical products for areas with applications for private or professional use
• must be able to establish a development process where modeling, testing and reflection via visual and functional models for interactive physical solutions and their application are part of a dynamic iterative process

COMPETENCES

• must be able to develop proposals for an interactive physical product for solving or supporting common problems and functions in relation to human needs and interaction
• must be able to communicate a solution for an interactive physical product, where function, technique and aesthetics are made probable using design-relevant media and methods and convey intention, process and applied methods and tools in reporting format

TYPE OF INSTRUCTION

Project work

EXTENT AND EXPECTED WORKLOAD

The student is expected to spend 27.5 hours per ECTS, which for this activity means 412.5 hours.
EXAM

EXAMS

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ADDITIONAL INFORMATION

Contact: Study Board for Computer Science via cs-sn@cs.aau.dk or 9940 8854

FACTS ABOUT THE MODULE

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<td>Lone Leth Thomsen</td>
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ORGANISATION

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<td>Department of Computer Science</td>
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<td>Faculty</td>
<td>Technical Faculty of IT and Design</td>
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INTERACTION DESIGN 5: QUALITATIVE METHODS

2021/2022

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE
The module builds on knowledge gained in 1.-4. semester

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

Disclaimer
This is an English translation of the module. In case of discrepancy between the translation and the Danish version, the Danish version of the module is valid.

PURPOSE
This course module aims to give the student insight into and an overview of qualitative methods, their scientific theoretical prerequisites and their practical application possibilities in interaction design. The module provides an in-depth introduction to methods for collecting qualitative data including ethnographic studies, structured and semi-structured interviews, case studies, observation and diaries, as well as methods for analysis of qualitative data, e.g. data coding, thematic analysis, and grounded theory. Including introduction and discussion of the basic concepts of generalizability, reliability, internal validity and external validity, as well as the scientific theoretical foundation of the methods. The course also introduces the specific applications of qualitative methods in interaction design, and trains the students' ability to select and apply qualitative methods.

LEARNING OBJECTIVES

KNOWLEDGE
- must be able to explain qualitative methods, their core concepts, applications, strengths, weaknesses, and limitations
- must be able to demonstrate insight into differences and similarities between different qualitative methods in relation to their specific application possibilities, generalizability, reliability, internal validity and external validity
- must be able to demonstrate knowledge of the application of qualitative methods to highlight issues concerning interaction design

SKILLS
- must be able to apply qualitative methods to highlight key issues regarding interaction design empirically and analytically
- must be able to formulate, assess and convey key issues within the concepts, application and limitations of the qualitative method
- must be able to argue on a methodological and methodological scientific basis

COMPETENCES
- must be able to carry out a specific qualitative study in relation to an issue concerning interaction design, and be able to argue for the specific chosen method, as well as reflect on its strengths and weaknesses

TYPE OF INSTRUCTION
The teaching is organized in accordance with the general teaching methods for the education, cf. section 17.

EXTENT AND EXPECTED WORKLOAD
The student is expected to spend 27.5 hours per ECTS, which for this activity means 137.5 hours.
EXAM

EXAMS

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ADDITIONAL INFORMATION

Contact: Study Board for Computer Science via cs-sn@cs.aau.dk or 9940 8854

FACTS ABOUT THE MODULE

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MEKATRONISKE PRODUKTER OG SYSTEMER

2021/2022

FORUDSÆTNINGER/ANBEFALEDE FORUDSÆTNINGER FOR AT DELTAGE I MODULET

Modulet bygger videre på viden opnået på Arkitektur & Design uddannelsens 1. - 4. semester.

MODULETS INDHOLD, FORLØB OG PÆDAGOGIK

Modulet har til formål at give viden og kompetencer angående teknologier, som bringes i anvendelse ved design og udvikling af mekatroniske produkter. Modulet introducerer og integrerer således viden om mekaniske og aktive komponenter, sensoring, simpel styring og interacedesign. Gennem design og studier af elektroniske styringer og interface på forskellige produkter, samt funktionalitet og formgivning af bevægelige mekaniske dele tilstræbes en forståelse af principper og løsningstyper. Der gennemføres øvelser, som giver de studerende træning i at arbejde med konkrete systemdesign for produkter, hvor de ovennævnte aspekter integreres på forskellig vis.

LÆRINGSMÅL

VIDEN

• Skal have viden om mekatroniske produkters basale karakteristika
• Skal have viden om almindeligt anvendte komponenter i forbindelse med det mekaniske design
• Skal have viden om grundlæggende styringsbegreber, eksempelvis open loop, closed loop og fejlsignalregulering
• Skal have viden om sekventiel styring, herunder boolean algebra og relaterede teorier og metoder for implementering af sekventielle styringer

FÆRDIGHEDER

• Skal kunne opstille og redgøre for et logisk diagram for et simpelt mekatronisk system med flere eksterne styreinputs
• Skal kunne sandsynliggøre simple mekatroniske systemer med konceptmodeller
• Skal kunne vurdere sammensætning af typiske komponenter indenfor styring og mekaniske funktioner, som kunne være relevant at inddrage i forbindelse med udviklingen af et mekatronisk produkt

KOMPETENCER

• Skal kunne vælge og sammensætte relevante komponenter til et løsningsforslag, samt være i stand til at analysere og implementere bevægelige komponenter, tilhørende elektronisk styring og interface for et produkt

UNDERVISNINGSFORM

Se generel beskrivelse af anvendte undervisningsformer i § 17.

EKSAMEN

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Intern prøve

## Vurderingskriterier
Vurderingskriterierne er angivet i Universitetets eksamensordning

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<td>[Sarah Guldhammer, Claus Lassen](<a href="mailto:sarah.guldhammer@kunst.aau.dk">mailto:sarah.guldhammer@kunst.aau.dk</a>, <a href="mailto:claus.lassen@kunst.aau.dk">claus.lassen@kunst.aau.dk</a>)</td>
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BACHELOR'S PROJECT

2021/2022

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

The module builds on knowledge gained in 1. -5. semester

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

Disclaimer
This is an English translation of the module. In case of discrepancy between the translation and the Danish version, the Danish version of the module is valid.

PURPOSE
Current design problem in interaction design. The project can be analytically and / or constructively oriented, and aims to give the student the opportunity to choose a topic of special interest in interaction design. Special emphasis is placed on working with integrated interaction design in the project module, where the student must combine elements from the fields of computer science and industrial design. The project can involve active collaboration with a company through the central phases of the project. At the end of the bachelor's program, students must have gained insight into an aspect of the subject's research area. As part of the project module, a poster must be prepared documenting the project's work.

LEARNING OBJECTIVES

KNOWLEDGE

• must be able to document knowledge and overview of the used techniques and concepts within the research area interaction design
• must be able to use correct subject terminology

SKILLS

• must be able to reason about and with the given concepts and techniques
• must be able to justify and choose relevant solution models based on knowledge of the possibilities and limitations given by the subject area's theories and methods
• must be able to convey an interaction design problem and the associated conceptual apparatus with a focus on integrated interaction design

COMPETENCES

• must be able to use the concepts and reasonings within the subject area to analyze and solve a selected current problem within integrated interaction design

TYPE OF INSTRUCTION

Project work

EXTENT AND EXPECTED WORKLOAD

The student is expected to spend 27.5 hours per ECTS, which for this activity means 412.5 hours.
## EXAM

### EXAMS

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## ADDITIONAL INFORMATION

Contact: Study Board for Computer Science via cs-sn@cs.aau.dk or 9940 8854

## FACTS ABOUT THE MODULE

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<td>Technical Faculty of IT and Design</td>
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INTERACTION DESIGN 6: USER EXPERIENCE

2021/2022

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

The module builds on knowledge gained in 1.-5. semester

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

Disclaimer

This is an English translation of the module. In case of discrepancy between the translation and the Danish version, the Danish version of the module is valid.

PURPOSE

The course aims to provide the student with knowledge of the user experience aspect of an interaction design, provide knowledge of forms of interaction that particularly prioritize this aspect, and introduce techniques that support interaction design processes with a special focus on user experience. The aim of the module is that the student will be able to create interaction designs with special focus on emotional, meaning-forming and value-creating aspects of the way a user subjectively experiences the design and interaction with a product or system.

LEARNING OBJECTIVES

KNOWLEDGE

• must acquire knowledge of design principles and guidelines for user experience design, e.g. expressive and persuasive interfaces, anthropomorphism and zoomorphism
• must gain insight into theoretical models of feeling and experience, e.g. emotional design, pleasure, or technology as experience the models
• must acquire knowledge of techniques for focusing on, developing and communicating the design of user experience, e.g. cultural probes and acting-out, sketching, picture scenarios, and personas
• must gain knowledge of opportunities and challenges in connection with the assessment of user experience in an interaction design, including techniques for evaluation in the field
• must gain knowledge of interaction design situations where the user experience aspect is particularly relevant, e.g. domestic computing, affective computing, social computing, product design, online shopping, learning, and computer games

SKILLS

• must be able to account accurately for key design principles, guidelines, theories and models for user experience design
• must be able to use techniques such as cultural probes, acting-out, sketching, picture scenarios and personas to design and communicate user experiences
• must be able to use techniques for systematic assessment of user experience in an interaction design

COMPETENCES

must be able to apply and reflect on relevant theory, principles and techniques in an interaction design process where the focus is on user experience

TYPE OF INSTRUCTION

The teaching is organized in accordance with the general teaching methods for the education, cf. section 17.
EXTENT AND EXPECTED WORKLOAD

The student is expected to spend 27.5 hours per ECTS, which for this activity means 137.5 hours.

EXAM

EXAMS

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ADDITIONAL INFORMATION

Contact: Study Board for Computer Science via cs-sn@cs.aau.dk or 9940 8854

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INTEGRATED PRODUCT DEVELOPMENT: DESIGN PROCESSES

2021/2022

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE
The module builds on knowledge gained in 1. -5. semester

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

Disclaimer.
This is an English translation of the module. In case of discrepancy between the translation and the Danish version, the Danish version of the module is valid.

PURPOSE
The aim of the course module is for students to gain professional knowledge and skills in applying an integrated design process, as a basic technical-scientific function-oriented development process that systematically and methodically involves and integrates hard and soft parameters in product development. Including knowledge of specific theories and scientific design methods that are central to the integrated project approach. As well as gaining skills in navigating and producing relevant information in a product development project through externalization and abductive reasoning that strengthens the handling of poorly defined issues and open processes. The skill in reflections on and representation of approaches, processes, methods and information production is practiced through portfolio and paper production with a focus on the integrated product design process.

LEARNING OBJECTIVES

KNOWLEDGE

• must be able to account for theories and methods regarding scientific knowledge production and their relation to the integrated design process' methods for integrating qualitative and quantitative parameters
• must be able to explain and evaluate theories, methods and models for an integrated design process, with a focus on creating new knowledge and relevant information for use in product development for specific users and target groups
• must be able to account for and evaluate methods for systematically transforming empirical data from the product's context of use into related qualitative and quantitative requirements, as well as reflect on this relationship

SKILLS

• must be able to apply the integrated design process' theories and methods in a product development process and be able to control navigation and knowledge production in this process, with regard to reflexively assessing both progress and goals
• must be able to switch with certainty between analysis and synthesis and in a systematic approach to the integration of qualitative and quantitative parameters
• must be able to describe, communicate and reflect on processes, methods used and information in a specific design production
• must in a scientifically honest way process and communicate in writing a specific problem within integrated product design

COMPETENCES

• must be able to methodically support independent implementation and dissemination of an integrated design process for product development for a specific use context, which systematically integrates qualitative and quantitative parameters with continuous analysis and synthesis-oriented activities, through reflections on both goal fulfillment and goal description
must be able to evaluate, communicate and reflect on a design process, its knowledge production and the degree of integration of selected parameters, as well as the validity and value of the individual activities
must be able to reflect on the relationship of own work to learning goals

TYPE OF INSTRUCTION

The teaching is organized in accordance with the general teaching methods for the education, cf. section 17.

EXTENT AND EXPECTED WORKLOAD

The student is expected to spend 27.5 hours per ECTS, which for this activity means 137.5 hours.

EXAM

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ADDITIONAL INFORMATION

Contact: Study Board for Computer Science via cs-sn@cs.aau.dk or 9940 8854

FACTS ABOUT THE MODULE

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SYSTEMANALYSE OG DESIGN

2021/2022

MODULETS INDHOLD, FORLØB OG PÆDAGOGIK

FORMÅL
Formålet er at give den studerende indsigt i de processer i softwareudvikling, hvor der specificeres krav til systemet, hvor der udarbejdes design af systemet og dets interaktion med brugerne. I tillæg skal der opbygges erfaring med anvendelse af denne viden i forhold til udviklingen af et konkret softwaresystem, som understøtter arbejdet i en organisation. Endelig skal den studerende opbygge praktiske erfaringer med design og implementering af brugergrænseflader.

BEGRUNDELSE
Analyse og design af softwaresystemer og deres brugergrænseflader er centrale aktiviteter i udviklingen af software. Disse aktiviteter bidrager til at styrke kvalitet og usability af softwaresystemer. I tillæg er evnen til systematisk og metodisk at kunne analysere et problemkompleks og på denne baggrund designe et softwaresystem med høj usability, der løser problemet, helt grundlæggende for at kunne udvikle software.

INDHOLD
Kurset gennemgår en metode til objektorienteret analyse og design samt de underliggende begreber og teorier. Der lægges vægt på udførelsen af metodens aktiviteter, og der inddrages eksempler fra praksis.

LÆRINGSMÅL

VIDEN

• objektorienteret analyse, herunder model, funktion, grænseflade, klasse, objekt, struktur, dynamik, brugsmønstre og funktioner
• objektorienteret design, herunder designkriterier og arkitektur samt model-, funktions- og grænsefladekomponenter

FÆRDIGHEDER

• kunne analysere og designe softwaresystemer med en kompleks funktionalitet og brugerinteraktion
• være i stand til at anvende Unified Modelling Language (UML) til at beskrive krav til og design af et softwaresystem

KOMPETENCER

• forklare processerne til kravspezificering, softwaredesign, og brugergrænsefladedesign samt deres samspil

UNDERSVININGSFORM

Kurset afvikles som et særskilt forløb i relation til de studerendes projektarbejde og valg af projekt. Undervisningen tilrettelægges i henhold til de generelle undervisningsformer for uddannelsen, jf. § 17.

OMFANG OG FORVENTET ARBEJDSINDSAT

Det forventes at den studerende bruger 30 timer per ECTS, hvilket for denne aktivitet betyder 150 timer.
EKSAMEN

PRØVER

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YDERLIGERE INFORMATIONER

Kontakt: Studienævn for datalogi via cs-sn@cs.aau.dk eller 9940 8854

FAKTA OM MODULET

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COMPUTER GRAPHICS PROGRAMMING

2021/2022

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE


CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

Objectives:

The course provides an introduction to real-time computer graphics concepts and techniques. The focus is on programmable functionalities (i.e., shader programs) of modern Graphics Programming Units (GPUs) as offered by graphics APIs such as OpenGL. It also covers the relevant underlying mathematical concepts (e.g., transformations between coordinate systems) and mathematical models (e.g., Phong’s reflection model), as well as how these are applied in GPU-based shader programs.

LEARNING OBJECTIVES

KNOWLEDGE

Students who complete the module will obtain the following qualifications:

- Ability to describe the programmable, hardware-accelerated graphics rendering pipeline as exposed, for example, by OpenGL, and its relationship and interaction with the central processing unit (knowledge)
- Ability to describe the concepts of vector bases, vector spaces, and coordinate systems as well as transformations between them (application)
- Ability to describe the mathematical representation of any rotation of 3D space by a matrix, by an axis and an angle, and by a quaternion (application)
- Ability to explain the computation of quadratic Bezier curves and splines (application)
- Ability to describe the interpolation of vertex attributes such as colors (e.g., for pre-vertex lighting), normals (e.g., for per-pixel lighting), and texture coordinates (knowledge)
- Ability to describe framebuffer operations including blending and depth tests (knowledge)
- Ability to explain acceleration techniques such as viewport clipping and backface culling (understanding)
- Ability to explain techniques to improve image quality such as antialiasing by supersampling and mipmap texture filtering (understanding)
- Ability to explain common performance bottlenecks of GPUs – including GPUs for mobile devices (understanding)

SKILLS

Students who complete the module will obtain the following qualifications:

- Ability to describe the 4x4 matrix representation and application of any 3D affine transformation in homogeneous coordinates and apply it in a GPU-based shader program (application)
- Ability to describe real-time local illumination models, in particular the Phong reflection model and apply them in a GPU-based shader program (application)
- Ability to explain texture mapping techniques including compositing of multiple textures, normal mapping, environment/reflection mapping, and shadow mapping and apply them in a GPU-based shader program (application)

COMPETENCES

Students who complete the module will obtain the following qualifications:
• Ability to create a program for procedurally generating and interactively controlling and rendering three-dimensional content (application)

TYPE OF INSTRUCTION

Refer to the overview of instruction types listed in § 17.

EXAM

PREREQUISITE FOR ENROLLMENT FOR THE EXAM

• To be eligible to take the exam the student must have fulfilled:
  • handing in of written assignments or the like
  • completion of certain – or all – study activities

EXAMS

<table>
<thead>
<tr>
<th>Name of exam</th>
<th>Computer Graphics Programming</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of exam</td>
<td>Written or oral exam</td>
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<tr>
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<td>Note that if admittance to the exam or parts of the assessment is to be based on written work or exercises, a deadline is stipulated for when the work must be handed in.</td>
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<tr>
<td>Assessment</td>
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<td>The criteria of assessment are stated in the Examination Policies and Procedures</td>
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FACTS ABOUT THE MODULE

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<tr>
<th>Danish title</th>
<th>Computergrafik programmering</th>
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<td>Responsible for the module</td>
<td>Claus Brøndgaard Madsen</td>
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ORGANISATION

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<td>Faculty</td>
<td>Technical Faculty of IT and Design</td>
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54
SOFTWARE ENGINEERING

2021/2022

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE
The module builds on knowledge gained in modules earlier in the education

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

Disclaimer
This is an English translation of the module. In case of discrepancy between the translation and the Danish version, the Danish version of the module is valid.

LEARNING OBJECTIVES

KNOWLEDGE

• on leading paradigms (e.g. traditional and agile) in the professional development of programs and systems, as well as theories, methods and techniques included in these paradigms (e.g. process models, requirements management, design, project management, testing, process improvement)

SKILLS

• using the subject’s terminology to accurately explain the selected paradigms, and be able to distinguish and compare these
• using the subject’s terminology to accurately explain theories, methods and techniques within the paradigms and their application in professional development of software intensive systems

COMPETENCES

• select, justify and apply appropriate paradigms, theories, methods and techniques in their own developmental contexts

TYPE OF INSTRUCTION

The teaching is organized in accordance with the general teaching methods for the education, cf. section 17.

EXTENT AND EXPECTED WORKLOAD

The student is expected to spend 27.5 hours per ECTS, which for this activity means 137.5 hours.

EXAM

EXAMS

<table>
<thead>
<tr>
<th>Name of exam</th>
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Criteria of assessment
The criteria of assessment are stated in the Examination Policies and Procedures

ADDITIONAL INFORMATION
Contact: Study Board for Computer Science via cs-sn@cs.aau.dk or 9940 8854

FACTS ABOUT THE MODULE

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<thead>
<tr>
<th>Danish title</th>
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ORGANISATION

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<td>Technical Faculty of IT and Design</td>
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</table>
DATABASE DEVELOPMENT

2021/2022

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

Recommended professional prerequisite: Basic knowledge of programming

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

Disclaimer
This is an English translation of the module. In case of discrepancy between the translation and the Danish version, the Danish version of the module is valid.

LEARNING OBJECTIVES

KNOWLEDGE

• the relational data model and its concepts
• data modeling (ERD / UML)
• transactions concept
• integrity restrictions including primary keys, promotion keys, checks and not null
• The SQL language for defining databases, basic and advanced extraction of data as well as modifying data
• Extracting information from a DBMS from a programming language such as PHP, Java or C#
• "Best practice" for good design and use of DBMS and SQL

SKILLS

• be able to construct a database design and a database schema
• demonstrate understanding of the relational data model
• construct and evaluate complex queries in SQL and other relevant queries
• construct transactions that meet relevant technical and business criteria

COMPETENCES

• use a database management system (DBMS) to store and retrieve information
• use SQL from a conventional programming language

TYPE OF INSTRUCTION

The teaching is organized in accordance with the general teaching methods for the education, cf. section 17.

EXTENT AND EXPECTED WORKLOAD

The student is expected to spend 27.5 hours per ECTS, which for this activity means 137.5 hours.

EXAM

EXAMS

<table>
<thead>
<tr>
<th>Name of exam</th>
<th>Database Development</th>
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### ADDITIONAL INFORMATION

Contact: Study Board for Computer Science via cs-sn@cs.aau.dk or 9940 8854

### FACTS ABOUT THE MODULE

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